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## HAY FEVER, ASTHMA, AND ALLIED AFFECTIONS.

By F. H. BOSWORTH, M. D.,

NEW YORK.

WHETHER hay fever prevailed previous to 1819 is an open question. It is altogether probable, however, that long before this it had existed without being recognized, but it was not until it had attacked a member of the medical profession, in the person of Dr. John Bostock, that it made itself recognized as a distinct disease. Its first appearance in literature was the account given by Dr. Bostock in a paper read before the Medico-Chirurgical Society of London in 1819, in which he described his own case under the name of "A Periodical Affection of the Eyes and Chest." Dr. Bostock continued his observations, and, in 1828, gave an additional account of the disease under the name of "Summer Catarrh."

Dr. Bostock's papers called forth many observations on the same subject, with various theories as to the causation of the disease, which possess only an historical interest. To Dr. Elliotson, I believe, is due the credit of the name of hay fever, which has been attached to the disease since his day, one of his patients, an agricultural laborer, having observed that his attacks were precipitated by inhaling the emanations of dry hay.

The history of the disease it is not necessary to enter upon, all the earlier writers having followed much the same line of investigation, with the addition only that, whereas the disease was originally attributed to the presence in the atmosphere of pollen of hay and grass, it was subsequently found, by clinical observation, that the attacks might be brought on by a very large number of causes, such as dust, smoke, gas, foul air, pollen of corn, of roses, and of various flowers, and fumes of any kind. Subsequently, however, the discussion of the subject seems to have crystallized itself about rag-weed,

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the poison of which, in this country, was found to be especially active in producing attacks of the disease. This suggestion, I think, was originally made by Dr. Marsh, of New Jersey. But, while often the attacks were easily traceable to the action of pollen of ragweed, it was found that many cases occurred during a time of the year when the ragweed was not in flower, and that, whereas certain cases occurred in the fall, coming on about the 28th of August and lasting until the first frost, others, again, came on in the summer, commencing about the 10th of June and lasting until August. Again, certain cases commence in May and last through the summer. The explanation of this lies, I think, in the fact that different individuals are susceptible to the action of different irritants, and the attacks only come on when their special enemy exists in the atmosphere. The only difference between these varieties of hay fever, it seems to me, is in the different irritants which give rise to the attack. The clinical history of the cases and the indications for treatment are the same. In what I say, therefore, it is to be understood that the term hay fever is to be used in its conventional sense, as describing a periodical influenza embracing all the varieties referred to.

It has always seemed to me that this discussion of the pollen theory of hay fever has been, to a certain extent, an idle one. There probably has been no fact in clinical medicine more thoroughly established than that the pollen of ragweed will, in certain persons, produce attacks of hay fever, and that these attacks continue, in a more or less aggravated degree, as long as the pollen is found in the atmosphere. The mistake is, I think, in regarding this as an explanation of the disease. It is simply a clinical fact and nothing more, and fails utterly in offering us any rational explanation of the real cause of the disease. So far has this discussion gone, that Blackley has given us a large octavo volume on hay fever, which is a model of painstaking, thorough scientific investigation, and which leaves no doubt as to the truth of the proposition, and yet at the end of all his researches we are no nearer a mastery of the disease than we were before. Still further observation of the pollen theory has shown that in certain regions of the country hay fever is unknown, and that persons who are subject to the disease, by resorting to these regions during the time of their annual attacks, become exempt. This geographical feature of the disease has also received exhaustive treatment at the hands of Dr. Wyman, who in his treatise on "Autumnal Catarrh" has given us an account of the geographical features of the subject which fills a large volume. There is an element of the prac-



tical in this in that it enables us to direct our patients intelligently as to where they may expect to find relief from their attacks.

A decided step in advance, I think, was made when Dr. Beard, of New York, breaking away from the old pollen theory as failing to explain the clinical facts of the disease, instituted a new series of investigations, the result of which was to demonstrate that behind the susceptibility to hay fever lay a peculiar nervous condition of the system. Beard's investigations were conducted by sending out a large number of circulars to all sufferers from hay fever whose addresses he could obtain, propounding a series of questions, mainly with reference to the periods of attacks, causes of attacks, the existence of any nasal disorders, and prominently as to the existence of any nervous habit in the individual or tendency in the family. His investigations seemed to demonstrate almost conclusively that, in a large majority of cases, there was either a family predisposition or a notably nervous tendency in the individual. His conclusions as to this latter point, it seems to me, can not well be questioned. An element of weakness, however, in his line of investigation lies in the fact that an examination was not conducted personally in each case, but that he depended upon answers received from circulars, which necessarily must be somewhat inconclusive, vague, and unreliable. The large number of cases analyzed by Beard, on the other hand, together with the great proportion of cases in which there was shown to be marked neurotic tendencies, lends a weight of argument to his conclusions, which, it seems to me, compels us to accept them.

We have, then, reached this further knowledge of the disease, that certain individuals of nervous habit who inhale the pollen of ragweed, roses, and certain other vegetable spores floating in the atmosphere, suffer from violent attacks of influenza, which continue while this especial pollen remains in the air. We still, however, fail of a full explanation of the disease. Neither the pollen theory nor the nervous theory is sufficient alone or together. The greatest step in advance was made, I think, when Daly, of Pittsburgh, read before the American Laryngological Association in Philadelphia, 1881, a paper on "Hay Asthma and Chronic Naso-pharyngeal Catarrh." Dr. Daly opened his paper by the very pertinent question, "whether we are warranted in believing any case of hay asthma purely a neurosis without first eliminating the possible causation by a local structural or functional disease in the naso-pharynx." After discussing his subject from this point of view, he reports three cases of hay

asthma cured, two of which were cases of hypertrophy of the nasal mucous membrane, and one a case of polypus, the cure in each case being obtained by removing the morbid condition in the nasal cavity.

We have here opened an entirely new field of study in this connection, and a hitherto unmentioned element in the production of the disease is brought forward. To Dr. Daly, I think, the full credit should be accorded for thus first calling attention to what I consider by far the most important element in the causation of an attack of hay fever.

The subsequent and most valuable contributions of Roe, of Rochester, Herzog, Hack, of Freiburg, Mackenzie, of Baltimore, and of Sajous, have all been in the direction of Daly's original observation, and have added much to our knowledge of the disease. Herzog first gave the name of rhinitis vaso-motoria to the disease, and this, I think, more accurately describes it than any other. John Mackenzie, on the other hand, gives, in his latest contribution, the name of rhinitis sympathetica—a term which I can not indorse. In this connection it might be mentioned that Beard, in his circular, gives prominence to the question, "Are you accustomed to have attacks of ordinary catarrh?" To which he received replies: yes, sixty-seven; no, one hundred and twelve; from which he very rationally draws the conclusion: "There is no necessary relation between any nasal or posterior catarrh and hay fever."

In answer to this I will simply say that the question is one which patients are not competent to answer, and which can only be answered by a personal investigation at the hands of one expert in making examinations of the upper air-passages. Of the sixty cases of hay fever which I have personally examined, I have seen none in which there was not notable obstructive lesion in the nasal cavities. The presence of pollen in the atmosphere does not explain an attack of hay fever, because pollen in the atmosphere affects comparatively few people. The existence of a neurotic habit fails to explain it, for thousands of nervous people are exempt from attacks of hay fever, although undoubtedly often exposed to its exciting cause. The existence of a morbid condition in the nasal cavities does not explain an attack, for numberless sufferers from catarrhal disease of the upper air-passages are exempt from attacks of hay fever. The true explanation, I think, lies in a combination of the three causes. Given an individual with marked neurotic tendencies, together with a morbid condition of the nasal cavities resulting in stenosis, and let



him be exposed to the pollen of ragweed or any other of the numberless germs and spores which produce the attacks, and we have all the elements necessary for their production, and the probability is that he is a fit subject for the disease and will suffer. It is not, however, all diseases of the nasal cavities which render one susceptible to attacks of hay fever, but, I think, only those whose tendency is to produce turgescence of the blood-vessels, with nasal stenosis. Recent writers on the subject—notably Mackenzie, of Baltimore, Sajous, of Philadelphia, and Ingals, of Chicago—recognizing the source of the disease as a morbid condition of the nasal mucous membrane, have given it the name of hyperæsthesia, special sensibility, irritability, etc.—general expressions which, it seems to me, fail to give us any definite idea of what the real morbid condition is. They are symptoms rather than structural lesions. Sajous, in his admirable monogram on the subject of hay fever, adopting this theory of the disease, bases his treatment on a plan for changing the nutrition of the membrane by cauterizing the surface, thus overcoming this special irritability or hyperæsthetic condition. This view, it seems to me, fails to recognize the real morbid condition in the nose which leads to its development. There is no established specific condition of the nasal mucous membrane which will produce hay fever, but it is liable to occur in connection with many diseases which we meet with in the nasal cavity, which can be definitely described under recognizable terms, and not under the very general expression of hyperæsthesia or irritability. It is not, however, all diseases of the nasal cavities which render one susceptible to attacks of hay fever, but, I think, only those whose tendency is to produce turgescence of the blood-vessels, with nasal stenosis.

To make my meaning clear, it is necessary to refer somewhat to the anatomy and physiology of the nasal mucous membrane. The mucous lining of the nasal cavities differs in no essential respects from mucous membranes in other portions of the air-passages except in the fact that there lie beneath it, on the turbinated bones, large masses of blood-vessels. The existence of these blood-vessels was well known to anatomists, as shown by John Mackenzie, as far back as the seventeenth century. Prominent attention, however, was called to them by Kohlrausch, and subsequently by Bigelow, who gave them the name of turbinated corpora cavernosa, and demonstrated that they comprise erectile tissue. This unfortunate designation of erectile tissue has been retained in all subsequent writings on the subject, and our ideas as to the true function of these tissues

has thus been very seriously hampered in the association of the erectile tissues of the nasal cavities with the other erectile tissues in the body. We are, therefore, led to regard them as bodies whose proper function it is to become erect. I do not recall any very definite observations on the subject of the true function of these cavernous bodies other than the somewhat vague observations of Bigelow, who mentions having seen them swell and subside in animals in much the same way as true erectile tissue in other portions of the body. That this is the function of the turbinated tissues I do not believe. I have never seen the slightest evidence in man of any physiological swelling or subsidence of these tissues, nor can I conceive any possible physiological function that could be served by such action on their part.

John Mackenzie has gone so far as to trace a certain reflex connection between the erectile tissue of the nose and that of the penis, in having observed that attacks of turgescence and irritability of the nasal mucous membrane follow the act of coitus. That there is any anatomical or physiological relation between the two bodies I think is not demonstrated.

In order to understand what the function of the turbinated bodies really is it is necessary to refer somewhat to the respiratory function of the upper air-chambers. The normal function of the mucous membrane is to secrete mucus, and only in such quantities as are sufficient to keep the membrane in a soft, moist, and pliable condition. Any excess of this amount becomes a morbid secretion. Normally nasal mucus is composed of 93 per cent. of water and 7 per cent. of solid matter. Robbed of a small portion of this water, it becomes thick, inspissated, and unhealthy. Now, as we know, every breath of air that passes through the nasal chambers and reaches the passages below must become surcharged with moisture; otherwise it would rapidly exert a deleterious influence on the mucous membrane of the air-passages beyond in robbing them of their moisture, and so rendering their mucus thick and inspissated. It is estimated by physiologists that in the course of twenty-four hours about five thousand grains of water are taken up by the inspiratory current of air in its passage through the nasal cavities. If, in other words, the humidity of the inspired air be compared with that of the expired air, it will be found that, in addition to the other changes as regards carbonic acid and oxygen, the inspired air will have gained five thousand grains of water. Now, I think I am safe in saying that, if five thousand grains of water were extracted from the mucous membrane



of the bronchial tubes and air-cells in the course of twenty-four hours, the result would be complete destruction of their function, to such an abnormally dry condition would they be reduced; for, as we know, in each act of respiration the inspired air reaches only the larger bronchial tubes, and the source of moisture, therefore, of the inspiratory current can not be from the smaller bronchial tubes or air-cells. We are, therefore, forced to the conclusion that this surplus of five thousand grains is taken up by the inspiratory current during its passage through the nasal chambers, and is still retained by it as it makes its way out through the air-passages, for the only source by which this amount of water could be taken up is the nasal mucous membrane. Certainly from no other mucous membrane of equal area in the body is it possible that such an amount of water could be secreted in twenty-four hours. Now, the mucous membrane of the air-passages is endowed with no especial apparatus for the secretion of water; the only secretory apparatus with which it is endowed is in the mucous glands, which secrete mucus alone.

In the nasal mucous membrane, however, we find an apparatus capable of furnishing this water, and this is the so-called erectile tissue of the turbinated bodies. The necessity for some such apparatus I need not refer to further than to say that it is absolutely necessary and essential, for the integrity of the lower air-passages, that the air which reaches them should be so far charged with moisture that they should not be robbed of any of their secretion. Especially is this true in a variable climate like ours, in which so great changes occur, characterized by excessive humidity or absolute dryness of the atmosphere.

This, then, is the great and prominent function of the nasal chambers, to so prepare the ingoing current of air that it shall exercise no injurious influence on the mucous membrane of the passages below. It has always seemed to me that this great respiratory function of the nasal chambers has been to an extent overlooked in regarding the nose as an olfactory organ, for whereas impairment or loss of the sense of smell is but an inconvenience, and not dangerous to the health, the impairment of the respiratory function of the nasal cavities involves very serious danger. Thus the nose as a respiratory organ becomes infinitely more important to us than as an olfactory organ.

As before stated, the nasal chambers contain no glands which secrete other than mucus. There are no serous glands. The mechanism, however, by which the water is poured out into the nasal

chambers, and the ingoing current thus surcharged with moisture, is in this so-called erectile tissue. The watery constituents of the blood transude the mucous membrane, and appear on the tortuous surfaces and passages of the cavity. Now, unless the blood-vessels underlying a membrane called upon for this duty were very large and very numerous, they would be inadequate to supply this large demand. Nature, therefore, has furnished the membrane in this region with such an abundant supply of large tortuous vessels that they assume the appearance of erectile tissue, and thus have given rise to this erroneous idea as to their function. Were the blood-vessels in this region of the same caliber and capacity as those of other portions of the air-tract, it is easy to understand how the extraction of so great a quantity of water would soon render the current sluggish by its greater consistence, and so completely arrest the function which they were designed to subserve. In addition to this large blood-supply there must be, of course, some delicate mechanism by which this function is regulated. This control is exercised by the vaso-motor system of nerves. So delicately must this be arranged that the transudation of serum must accurately adapt itself to every existing atmospheric condition. To-day, for instance, with air saturated with moisture, the turbinated vessels must be so far kept in control by the vaso-motor nerves that no serum escapes. To-morrow, again, with an almost absolutely dry atmosphere, under the action of the vaso-motor nerves, the blood control is unlocked, as it were; the turbinated vessels are so charged with blood that the current becomes active, and the amount of serum poured out on the mucous surface of the nasal cavity is such as to thoroughly saturate the ingoing current of air with moisture, and still not impair the consistence of the blood flowing through the vessels. This control must be so delicately exercised as to meet not only daily, but even momentary changes in the humidity of the inspired air. It is easy to see, therefore, how great the demand must be upon the vaso-motor nerves which regulate the caliber of these blood-vessels, how constant the watchfulness which controls this exosmotic action, and therefore how easily any impairment of this function might occur.

Coming back to the question of hay fever, I think the best appreciation of it lies in the recognition of the fact that the prominent local symptoms of the exacerbations are caused by disturbance of this great respiratory function of the nasal cavities. And, furthermore, that this impairment is primarily induced by some local morbid conditions in the nasal passages, and that the clinical history of the



attack is only completed by the existence of the neurotic habit, and the attack precipitated by its favorite cause, whether it be pollen of ragweed, flowers, or any other irritant.

As before stated, there must be some local condition which produces a turgescence of the blood-vessels with narrowing of the passages, and of these two I am disposed to regard nasal stenosis as by far the most active. The mechanism of this action is easily explained. If from any cause the anterior portion of the nasal cavity is narrowed (and it is this portion of the cavity which is always narrowed by any turgescence of the blood-vessels, no matter how slightly the turgescence encroaches on the caliber of the passages), it is easy to see how in every act of inspiration the air immediately behind the point of obstruction becomes rarefied. The atmospheric pressure is diminished behind the point of stenosis. This illustrates how the continued action of comparatively trivial causes will eventually lead to notable morbid changes, for, if this action continues for a time, the incoming current of air being checked or obstructed, the air behind the point of obstruction being rarefied, a tendency is rapidly developed in the mucous membrane of the nose to sag down or pouch into the cavity. This puffing out of the membrane is attended with a dilatation of the blood-vessels, especially those of the turbinated tissues.

Let us illustrate this by a case of deflection of the cartilaginous portion of the nasal septum. Cases frequently come under our observation in which an injury of the nose has resulted in an angular deflection near the nostril, producing marked stenosis. The clinical history of the case will almost invariably show that the prominent symptoms resulting from this injury do not set in for five, ten, or even fifteen years later. What has happened has been this: The patient has gone on all this time breathing through a narrowed passage. With each act of inspiration the air behind the point of obstruction is rarefied; the membrane is subjected, therefore, to something of a dry-cupping process which produces a marked relaxation of the vessels. As this process has been going on for years, it has resulted in pouching down or sagging out of the turbinated tissues, together with a certain amount of local inflammation which is produced by the turgescence, and this finally results in permanent impairment of the respiratory functions of the mucous membrane.

Now, if in this case there is a neurotic habit, so-called, we have all the elements favorable for the development of an attack of hay

fever when the proper pollen impinges on the membrane. What the actual morbid condition is in what we call neurosis no one has yet told us, but, if clinical facts teach us anything, they would teach that certainly in a very large proportion of cases the special lesion in the neurotic habit lies in a weakness of the vaso-motor control, this weakness showing itself in whatever portion of the body it may select or be drawn to by other causes. If my view of hay fever is correct, we have a special tendency in the nasal mucous membrane to the development of this lack or weakness of vaso-motor control in the fact that the muscular fibers controlling the caliber of the blood-vessels are already weakened by the dry-cupping process already alluded to. So, in the illustrative case of deflected septum, the essential local condition that has arisen is dilatation of the blood-vessels which compose the turbinated bodies under the influence of diminished atmospheric pressure, a weakening of the muscular fibers which regulate their caliber, and their escape to a certain extent from the control of the vaso-motor nerves.

As regards the part which pollen plays, as before stated, there is no fact in medical science more thoroughly established than that in certain persons the pollen of ragweed, for instance, will produce an attack of hay fever. How this attack is induced is not easy of explanation. On the other hand, how a grain of opium taken into the stomach will produce sleep, or a solution of cocaine applied to a mucous membrane will produce anæsthesia or contraction of the blood-vessels, can not be explained. The fact, however, remains that a four-per-cent. solution of cocaine applied to a mucous membrane will produce rigid contraction in the muscular fibers of its blood-vessels, as we know by observation. So the pollen of ragweed applied to the mucous membrane of the nasal chamber will produce paralysis of the muscular fibers of the blood-vessels in certain individuals who are susceptible to this action and in whom these vessels are already weakened by some local diseased condition of the nasal mucous membrane.

I have not alluded to the symptoms in an attack of hay fever, because they are sufficiently familiar to all. It may be stated, however, that the attacks are believed to consist essentially in a paralysis of the muscular coat of the blood-vessels, resulting in their marked dilatation together with a profuse escape of serum, all the subsequent symptoms being traceable to this primary cause. The vaso-motor control of the blood-vessels being thus unlocked, the watery discharge becoming very great, the whole membrane is thoroughly



sodden, as it were; the passages are obstructed; the membrane of the two sides of the nasal cavity being in contact, the terminal filaments of the nerves pressed upon, an intense irritation, pain or itching, with complete occlusion of the nostril, results. Now, this vaso-motor paralysis, which it really is, with a profuse discharge of serum, constitutes a complete unlocking of the whole activity of the respiratory function of the nasal cavity, a letting out of its whole power and potency. This respiratory function of the nose is simply an exosmosis of serum, but this, taking place in the rapid and profuse way mentioned, constitutes a flooding of the membrane rather than a flooding of the cavity, and therefore causes extreme turgescence of the blood-vessels with complete stenosis of the passage.

Now, an exacerbation of hay fever differs essentially from an ordinary attack of acute rhinitis or cold in the head. Hay fever, from its onset until its termination, is characterized by suffusion of the nose, marked stenosis, and a discharge of serum, whereas an attack of acute rhinitis runs through regular stages of turgescence, with dryness, secondarily profuse watery discharge, and a third stage of muco-purulent discharge, and final resolution. Hay fever commences with a watery discharge, and this continues until the end of the attack, with violent sneezing and other concomitant symptoms.

It has been attempted to divide the generic disease hay fever into two varieties—rose cold and autumnal catarrh—rose cold being that form which, commencing on the 10th of June, ceases on the 1st of July, while the name autumnal catarrh has been given to that form which, commencing on the 29th of August, persists until the occurrence of the first frost. Beard makes a point of having discovered a third variety, what he called the middle form of hay fever or July cold, describing a class of cases in which the attack came on in the middle of July and disappeared on the 1st of August. Any one seeing a large number of cases of hay fever is very soon impressed with the fact that it is exceedingly difficult to form any classification of this sort, and, moreover, any such classification is rather idle, the disease being the same whether occurring early or late in the season, and, besides, the attacks are very apt to become exceedingly irregular. The deduction, however, from this irregularity would seem to be that the agents which are capable of producing an attack of hay fever are almost numberless, and that, while one patient is susceptible to the action of one agent, another is susceptible to the action of a totally different agent, or the same individual may be susceptible to the action of a large number of irri-

tating agents. This is shown by the fact that very many patients have two, or even three, attacks in the course of the year. What the special cause of hay fever is it is difficult to lay down as an absolute law. That the pollen of flowering plants is by far the most frequent and active, I think, can not be questioned. That the most irritating pollen which is found in the atmosphere is that of the ragweed would seem to be proved by the very exhaustive and painstaking experiments of Blackley; but that the pollen of most flowering plants possesses, to a certain extent, irritating qualities is probable, and hence the pollen of any plant that flowers from the earliest spring till late autumn may be a possible cause of hay fever. Each individual, of course, has his special susceptibility, and while in one it may be the pollen of roses, in another the pollen of July plants, in another it is the pollen of August flowers.

Dr. John Mackenzie, of Baltimore, who has made a most instructive study of this disease, and has written largely on the subject, takes very decided ground against this pollen theory. In his latest contribution he instances the case of a patient who suffered from rose cold, having had her attack brought on by the presence in the room of a rose made of glass. This proves nothing, but simply adds another instance to the long list of curious facts, of which medical literature is full, of the influence of the mind upon the body, as, for instance, when a chill is precipitated or postponed by changing the hour-hand of the clock.

The pollen of flowering plants is not to be regarded as the only ingredient of the atmosphere which may be the irritant giving rise to an attack of hay fever. Among the earliest assigned causes was sunlight, and that the varying conditions of solar heat may be one of the possible causes is probable. Different conditions of humidity may act in certain cases. Many patients with hay fever suffer during damp weather, while I have known other patients to whom a damp day gave infinite relief. Among the causes, therefore, we may recognize, in addition to pollen, dust, smoke, gases, bad air, sunlight, the emanations from various drugs—such as camphor, hartshorn, ether, ipecac, etc., perfumes of various kinds, etc., etc.

Herzog, as before remarked, first gave the name of rhinitis vasomotoria to hay fever. John Mackenzie, of Baltimore, added to Herzog's title of rhinitis vasomotoria, periodica—a name which describes the disease with a fair degree of accuracy, its periodicity being dependent on the periodicity of the special pollen in the atmosphere which is the source of the attack in each individual.



If, now, we attempt to give a definition of the disease which has been known in literature for the last half century as hay fever, autumnal catarrh, etc., it would be somewhat as follows:

Hay fever is a disease characterized by the annual recurrence at certain nearly fixed periods of the year of attacks of influenza, whose prominent features are: profuse watery discharge from the nose, intense itching, violent sneezing, nasal stenosis, headache, etc., due to the presence in the atmosphere of certain irritating particles, prominent among which is pollen of certain flowering plants, the attack lasting as long as the atmosphere contains these irritating particles, and, when it passes away, leaving the air-passages apparently uninjured by the visitation.

I have heretofore said nothing in regard to hay asthma, so called. This I regard as merely one of the sequelæ or concomitants of ordinary hay fever. In a certain proportion of cases, after the hay fever attack has persisted for a length of time, a new set of symptoms develops, which consists in attacks of what are called spasmodic asthma, coming on generally at night, lasting for some hours, passing away in the early morning, in this respect differing in no essential particular from the disease which has ordinarily been described as spasmodic asthma, with the exception that its development has been preceded by a periodical influenza.

During the past five years a very large number of cases of hay fever, hay asthma, and so-called spasmodic asthma, have come under my observation. A careful study of these cases soon led me to the conclusion that, in the main, hay asthma and nervous asthma, so called, are one and the same disease in all essential features; and in the same way that a structural disease of the nasal cavity gives rise to weakness of the blood-vessels and thereby a liability to attacks of hay fever, and, still further, as an attack of hay fever in a proportion of cases brings on an attack of asthma, just so these structural lesions in the nasal cavity, without the interposition of an exacerbation of hay fever, may lead, in certain individuals of neurotic habit, to the development of what we know as spasmodic asthma. I do not propose to go over the same line of argument here at length that I have already gone over at the commencement of my paper, but I think the same law applies. Given an obstructive lesion in the nasal passages, the pulmonary mucous membrane is subjected to the same influences as the spongy membrane of the nose with each act of inspiration—that is, atmospheric pressure is markedly diminished with every inspiration throughout the whole of the bronchial tract. The result is, as be-

fore shown, a tendency to dilatation of the blood-vessels through gradual weakening of the muscular control. The old discussion as to the true nature of asthma need not be renewed. Whether we have to deal with a disease which may be divided into three classes—gastric, cardiac, and bronchial—I pass over as based on insufficient clinical observation.

As early as 1872 Voltolini called attention to the dependence of asthma on the existence of nasal polypus. Still later many observations were made confirming this view, and cases reported in which asthma had been cured by the removal of a nasal polypus. The general impression, however, I think, has been that these were exceptional cases, and that a case of asthma which can be traced to the existence of nasal growths was simply a fortunate one, as affording definite indications for treatment. My own observations would go to show that the existence of nasal disease is not an exception, but the rule. I think I may go still further and say that during the past four years, in which time my attention has been especially called to this subject, I have seen no single case of spasmodic asthma in which the source of the disease could not be traced to the existence of some disease in the nasal cavity. This is a broad statement, but, I think, one fully justified by my experience.

Before the introduction of cocaine an accurate inspection of the nasal cavity could not be made. Since, however, we have been enabled to thoroughly expel the blood from the turbinated tissues in the nose by the local application of cocaine we have been able to make a thorough and accurate diagnosis in every case which has come under observation. During the past eighteen months I have made many inspections of the nasal chambers in asthma, and treated many cases. In no single instance, I think, have I failed to detect a sufficient cause for the attack, and in few instances have I failed to give marked relief by treatment entirely confined to the nasal passages.

I do not propose to enter upon a full discussion of the clinical history of the disease, but there are certain salient points in connection with it which I think will be made clearer by the following cases which I have selected from my note-book. I pass over many cases of nasal polypus which have been under treatment in which asthma was a prominent symptom, and in which this distressing feature of the disease was entirely relieved by the removal of the polypus. The cases which I report are simply cases which presented obstructive disease of the nasal cavity resulting in spasmodic asthma.



CASE I.—Mrs. K., married, aged thirty-seven, has been a great sufferer from asthma since she was twenty-five years of age. In the intervals of her attacks she has had more or less nasal catarrh, so called, yet has never associated the two diseases, but she has noticed that her asthmatic attacks have always been preceded by a mild cold in the head, attended with sneezing and suffusion of the eyes and nose. The attacks generally occur at night; at times they are very severe, and are usually brought on by a storm or threatened bad weather. She has never received any relief from the various remedies she has tried, and was finally compelled to take up permanent residence in Colorado, where she was entirely free from her asthma, but not from her catarrhal trouble. She left Colorado on October 1st on her way East, and early in November, while in Michigan, her asthma came on, and continued until I saw her on the 18th of November, 1884. An examination of the nasal cavity showed a prominent angular spur projecting into the left passage at the anterior edge of the vomer at its junction with the cartilage of the septum and the perpendicular plate of the ethmoid, producing marked interference with the passage of the air. In the right nasal cavity was a notable thickening of the mucous membrane covering the middle turbinated bone, with that peculiar enlargement which is so frequently met with in connection with deflection of the septum to the opposite side, being apparently an unrolling of the scroll-like folding of the bone.

This case came under my observation a few days after I had first noticed the peculiar action of cocaine on the blood-vessels. I therefore applied for the relief of the attack, which was upon her when she visited me, a two-per-cent. solution freely to both cavities. The result was almost complete relief of the asthma in a very few minutes. This, I believe, was the first case in which cocaine was ever used in asthma, and demonstrated completely its valuable remedial effects in the exacerbation.

The subsequent history of this case consisted in combating her asthmatic symptoms temporarily by the use of cocaine with entire success for the time being, although the applications required renewal three or four times a day, and sometimes oftener. On the 21st of December the right middle turbinated bone was removed with the snare. A large mass, half an inch long and about a quarter of an inch in each diameter, came away. The result of the operation was striking relief, although the serious trouble was in the opposite cavity. This single operation gave so much relief that, with the occasional use of cocaine, the patient remained East during the following twelve months in a state of comparative comfort. In January, 1886, I commenced operating on the left side, removing small pieces at a time

with a fine saw, and at the present time each passage is fairly clear, and the patient virtually cured of her asthma.

The interesting points in this case are: the demonstration of the intimate connection between the nasal stenosis and the asthmatic attacks, the successful use of cocaine for the temporary relief of stenosis, and successful resort to surgical measures for the radical cure of the disease.

CASE II.—Mr. S., aged forty-three, merchant, called to see me October 14, 1884, with the following history: For fifteen years he has been a sufferer from asthma, the attacks coming on early in May, lasting until the 1st of June, and coming on again in the middle of August, lasting until cold weather. The family history in this case was strikingly neurotic, showing for three generations a large number of cases of hay fever, asthma, and other nervous diseases. In addition to his asthmatic attacks he had each year more or less catarrhal trouble. Examination of his nasal cavity showed very marked hypertrophy of each turbinated bone, the mucous membrane on each side being in contact with the septum, which was slightly deflected to the left. I immediately removed by the snare the left middle turbinated bone, extracting a large mass, with the result of immediate relief from his stenosis. The only untoward symptom in this case was hæmorrhage lasting two days, which was arrested with the greatest possible difficulty. The result of the operation was complete relief from his asthma for that season. Fearing to operate on the right side on account of hæmorrhage, the treatment there was confined to cauterization, which was made at intervals of perhaps a month. I last saw this patient on the 17th of January, this year. The result has been virtually complete relief from both hay fever and asthma.

This case possesses an additional interest in the excessive hæmorrhage from the middle turbinated bone, which would seem to verify my former statement in regard to a vaso-motor paralysis constituting the essential lesion in the nasal cavity which causes both the hay fever and the asthma. With one other exception, in all my experience I have not met with any severe hæmorrhage in operating upon the middle turbinated bone.

CASE III.—Frank C., aged seventeen, consulted me November 26, 1883, having been a sufferer from asthma since he was two and a half years of age. The attacks were characterized by dyspnoea, cough, expectoration, etc., coming on at all times of the year and nearly every day, lasting several hours. He was a pale, emaciated, ill-nourished subject, with notable pigeon breast. An examination showed a fracture of the cartilaginous portion of the septum, with a marked angular spur projecting into each nostril, together with very notable hypertrophy of each lower



turbinated bone. A mass was removed by the snare from the left lower turbinated bone anteriorly, which brought into view a still larger mass of hypertrophied tissue on the left middle turbinated, which was also removed by the snare at the same sitting. I saw this patient again on the 11th of December, when he reported that he had been entirely free from asthma, although considerable discharge and nasal stenosis still existed. I again removed from both the lower and the middle turbinated bone of the left side small masses of hypertrophied tissue, with the result of markedly clearing the passage of that side. It was a very interesting observation during this sitting that in using a pledget of cotton to wipe away the secretions of the left side the patient was seized with an attack of asthma, the result of this obstruction to the nasal passage. I removed the cotton, and, after waiting a few minutes, put my finger over the left nostril. *The asthma immediately returned*, disappearing upon the removal of my finger.

On June 30, 1884, I saw the patient again, when he showed marked improvement in general health, had gained in weight, and had almost entire freedom from asthma until within a few days. I removed still more tissue from the left nostril, and also commenced to operate upon the right. December 6, 1884, the patient was free from asthma, but there was still some obstruction. The spur of the septum was removed by the saw. The subsequent history of this case consisted in visits at my office at intervals of from three to six months, with entire freedom from asthmatic attacks until within a few days of each visit, when I found sufficient structural lesion to account for renewal of the attack. Continuing my operations, I did my last one on the septum of the right side on October 1, 1885, since which time his progress has been entirely satisfactory, gaining in health and strength, and enjoying immunity from his disease. The only points of special interest in this case were the success which attended operative measures in a patient whose case seemed to be an exceedingly unfavorable one on account of his general condition, and the striking illustration of an attack of asthma produced by plugging the nostril, as occurred on his visit at my office December 11, 1883.

CASE IV.—Mr. S., aged forty-eight, consulted me first on November 21, 1885, giving the following history: About a year ago he commenced to suffer from asthma, his attacks coming on usually every day for about two hours in the afternoon, and again at night he would be awakened after falling asleep. During cold weather he was usually free from any trouble. This gentleman came to me with a fully developed attack upon him, breathing being very labored and notably cyanotic. As an experiment I applied a four-per-cent. solution of cocaine in each nostril, and, with my ear to his chest and my watch in my hand, I timed accurately the duration of the attack. *At the end of fifty seconds not a r le could be heard* by auscultation, and the relief was complete. An examination of his nasal cavity now showed deflection of the septum to the right, with a spur running from before backward parallel with the floor of the left

naris, and at the junction of the vomer with the palatal process of the superior maxillary bone there was also notable hypertrophy of the right lower turbinated bone. I made an application of chromic acid to the lower turbinated bone, and saw him again November 24th, when he reported entire freedom from asthma for two days. The cauterization was repeated on that day and again on the 28th. On the 7th of September the cartilaginous spur in the right naris was removed. On the 28th the projecting portion of the septum was removed. With the exception of an attack of asthma during a severe storm in January, this patient has been entirely relieved.

CASE V.—S. F., aged fifty-four, called to see me January 6, 1885, with a history of catarrhal trouble for many years, with nasal discharge and liability to colds, which of late have developed into a cough. Last winter, and also this winter, his bronchial attack has been attended with oppressed breathing. In addition to that, he also suffers severely from what he has considered nervous headaches. An examination in this case showed a notable deflection of the septum to the right side, with a septal spur at the articulation of the vomer with the superior maxilla. In this case treatment was confined entirely to the use of the saw, removing the irregularity of the septum on each side. His trouble was for a time somewhat aggravated by the copious catarrhal discharge which was set up as the result of each operation. But when finally the septum had been restored to a fairly normal contour, and the passages had been rendered open, his symptoms gradually improved until, with the exception of a mild attack in March, he has not only been relieved from his asthmatic attacks, but notably relieved from the headaches which at times had been so severe as to unfit him for business.

CASE VI.—Mr. C., aged forty-seven, merchant, consulted me November 6, 1883, with a history of recurrent attacks of spasmodic asthma for the last fifteen years, recurring without any special periodicity under the influence of changes of the weather, colds, etc. For two years he has been troubled with catarrhal discharge, characterized by an accumulation of mucus in the fauces, with some nasal stenosis. An examination of the nasal cavity showed a moderate amount of hypertrophy of each lower turbinated bone with very marked enlargement of the middle turbinated, and in the vault of the pharynx a large mass of adenoid tissue. I made a number of applications of chromic acid to the turbinated bones, both lower and middle, but without giving entire relief until, in the following spring, I removed, by means of a curved snare, the *mass of glands in the vault of the pharynx*, since which time he has been *completely free from his asthmatic attacks*. This case presents considerable interest in the fact that the asthma was dependent upon the obstruction due to the existence of an adenoid in the vault of the pharynx, a growth which I really believe belonged to the food-tract rather than to the air-tract, but adventitiously offering, of course, a certain amount of obstruction to the free entrance of air to the lungs. This patient had no further attacks. I have



never seen a case of hay fever dependent upon the existence of an adenoid of the pharynx, nor do I believe such a thing possible. In all cases, I think, the vaso-motor weakness is below the obstruction, and never above it. Therefore an obstruction due to the existence of an adenoid can only result in an attack of asthma, or, as I think we might properly designate the disease, a vaso-motor bronchitis, just as we designate hay fever vaso-motor rhinitis.

I might repeat these cases, but I have reported sufficient to bring out the points which I desire to emphasize, and these are the direct dependence of a large majority of, if not all, cases of asthma upon some obstructive lesion in the nasal cavity. This is evidenced by the immediate relief from the exacerbation by the use of cocaine in the nose in every case in which I have tried it; and, furthermore, the cure of so many cases by the removal of the structural lesion which exists in the upper air-passages. The foregoing cases, it seems to me, illustrate these points fairly well. I have on my records between forty and fifty cases of asthma, the report of which would be only a repetition of the foregoing, but every one, I think I may truly say, substantiating this statement. Further proof of this, I think, is offered in the clinical history of so many cases of asthma which depend on hay fever in that the asthmatic attack never comes on until the nasal symptoms have persisted for some days or even weeks, being apparently precipitated by the persistent nasal stenosis. Furthermore, clinical observations are accumulating which go to show the frequency with which asthma takes the place of hay fever, the nasal symptoms subsiding, and the disease settling down into what we call a chronic spasmodic asthma.

Of the diseases of the nasal cavity which may give rise to asthma may be enumerated nasal polypus, deflected septum, deformity of the septum as a result of fracture, exostosis, ecchondrosis, hypertrophic rhinitis, displacement of the columnar cartilage, or, indeed, any disease which obstructs the free entrance of air to the nasal chambers. Of these causes, by far the most frequent is deformity of the nasal septum, my notes showing that, with the exception of nasal polypus, such a deformity is responsible for over ninety per cent. of the cases.

The prognosis of asthma, I think, needs to be entirely rewritten. Heretofore it has been regarded as one of the obstinate diseases, or, to an extent, one of the incurable diseases. From the point of view of internal medication, certainly our success in its treatment has not been flattering. From the point of view which regards it as depend-

ent upon nasal disease, the prognosis, it seems to me, becomes very much more favorable. Certainly my own experience in its treatment would go to show that it is a disease in which, in the majority of cases, we are safe in offering a favorable prognosis. That all cases are curable I do not think can be said. That most cases are curable I believe is a safe assertion, for, with our present methods of diagnosis and treatment, I believe we have got to that stage where we can call that disease formerly known as nasal catarrh, and which embraced all diseases of the nasal cavity, a curable disease; and just as far as we can cure nasal diseases, just so far can we cure asthma. Of course, I do not wish it to be said that the nasal lesion is the only indication for treatment, but it is a prominent one. Those general hygienic measures, and perhaps internal medication, by which we overcome what we call the neurotic habit, are by no means to be neglected; but this part of the subject I do not propose to enter upon.

The main object of my paper has been to bring forward the influence of diminished atmospheric pressure, due to nasal stenosis, upon the mucous membrane of the air-passages beyond the point of obstruction as leading to dilatation of the blood-vessels and weakness of vaso-motor control, thus giving rise to attacks of "hay fever" in the nasal chambers and spasmodic asthma in the bronchial tubes. This action of diminished air-pressure has been alluded to by Dr. A. H. Smith ("Medical Record," August 6, 1881) as a cause of hyperæmia and supersecretion. If the points I have endeavored to establish have been made clear, it will be understood that I do not regard supersecretion of mucus as the result of this diminished air-pressure, but rather as a serous exosmosis from a weakening of vaso-motor control.





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